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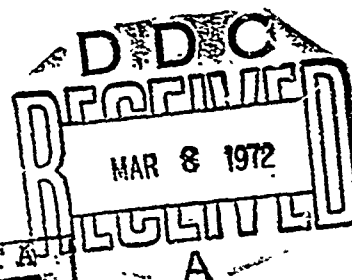
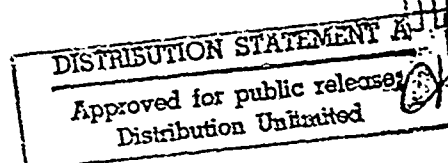
GROUP HOMOGENEITY, COMPATIBILITY AND ACCOMPLISHMENT

E. K. ERIC GUNDERSON & DAVID RYMAN

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13. ABSTRACT <p>The relationships of heterogeneity on personal history and personality variables to group compatibility and accomplishment were studied in 15 groups of scientists and Navy men who manned scientific stations in Antarctica.</p> <p>Group effectiveness criteria were mean scores on questionnaire items which described the group as a whole and which were administered to group members after several months of isolation and confinement. Heterogeneity (group standard deviations) on urban-rural residence, importance of hobbies and recreational interests, and personality needs most relevant to group integrity and achievement were significantly related to group performance. These exploratory findings should help develop useful approaches to the group assembly program.</p>			

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Abstract

The relationships of heterogeneity on personal history and personality variables to group compatibility and accomplishment were studied in 15 groups of scientists and Navy men who manned scientific stations in Antarctica.

Group effectiveness criteria were mean scores on questionnaire items which described the group as a whole and which were administered to group members after several months of isolation and confinement. Heterogeneity (group standard deviations) on urban-rural residence, importance of hobbies and recreational interests, and personality needs most relevant to group integrity and achievement were significantly related to group performance. These exploratory findings should help develop useful approaches to the group assembly problem.

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4/14/69 Dr. Gunderson advises to leave
this manuscript as a Unit report. It
has never been published.

Group Homogeneity, Compatibility, and Accomplishment¹

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Effectiveness of group efforts and work organizations is assumed to depend in some degree upon mutually positive attitudes among group members. In other words, group compatibility or cohesiveness is often considered a necessary, although perhaps not a sufficient, condition for group effectiveness. Group accomplishment also depends upon other factors, such as achievement needs or motivations of group members and relevant environmental conditions, but if the proposition is true that compatibility generally exerts a facilitating influence upon group efforts, then the investigation of antecedent variables related to group compatibility should contribute to better understanding of the determinants of group productivity.

In the present study, homogeneity of group members on a number of social background, attitude, and personality need variables was related to measures of compatibility and accomplishment in extremely isolated groups. It seems plausible that group tensions or conflicts might be more frequent and more pronounced in groups where members vary markedly in attitudes and values, particularly where wide differences exist on issues that are important for group maintenance or achievement.

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A number of investigators have demonstrated positive relationships between social background or attitude similarity and interpersonal attraction as measured by sociometric techniques (Byrne, 1961; Lott & Lott, 1963; Newcomb, 1961; and Rosenberg, 1956). In Newcomb's study (1961) of a students' dormitory, the data suggested that agreement on issues about which individuals are personally concerned is more important for interpersonal attraction than agreement on other issues. Byrne and Nelson (1964) failed to find support for this hypothesis in a study in which students responded to paper and pencil descriptions of "strangers."

Winch (1958) proposed that for certain personal needs, for example, dominance-submissiveness, complementarity or reciprocity should enhance compatibility. Empirical evidence for the complementarity hypothesis has been largely negative, but the different methods and populations employed make interpretation difficult. While the complementarity hypothesis cannot be tested directly in the present study, positive relationships between heterogeneity and compatibility would tend to be consistent with that hypothesis. For example, large variances on needs for dominance-submissiveness would permit reciprocity on this variable and perhaps be associated with enhanced compatibility.

In addition to congruence (similarity) and complementary relationships, Haythorn (1957) has suggested that personality characteristics leading to competition, e.g., dominance need, be considered in group composition studies.

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In an earlier study, Nelson (1964) demonstrated that homogeneity of three- to six-man work groups on age was positively related to cohesiveness as measured sociometrically, but only after several months of close association in isolated groups. In the present study, measures of group compatibility and accomplishment were derived from questionnaire items which described the group as the whole and which were administered to all station members after approximately six months of isolation at scientific stations in Antarctica. Construction of these scales was described in a previous report (Shears & Gunderson, 1966), and the relationships of earlier versions of the scales to an independent criterion of group effectiveness have been described elsewhere (Gunderson & Nelson, 1965).

Negative correlations between heterogeneity indices (standard deviations) and mean Compatibility scores would indicate that wide variation in attitudes and personality needs were detrimental to group harmony and cooperation. Heterogeneity on attitudes and values most closely related to group integrity and work achievement were considered most likely to relate significantly to compatibility and accomplishment. Based upon Nelson's earlier study, variance on age was expected to correlate negatively with compatibility.

Methods

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Subjects.

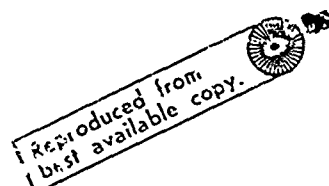
Subjects for the study were approximately 270 Navy and civilian

participants in the U.S. Antarctic Research Program (Operation Deep Freeze) who composed 15 wintering-over parties at small scientific stations on the Antarctic continent. The mean age for both Navy and civilian groups was 27 years. Navy men frequently were high school graduates (57%) while the scientists and technicians typically were college graduates (66%). Groups varied in size from eight to 30 men and consisted of a wide variety of occupational and scientific specialties. Navy men were responsible for construction, maintenance, and support activities while civilians carried out scientific projects in several disciplines, but principally in the atmospheric and earth sciences.

Procedure.

Groups were assembled de novo in the Antarctic and remained together for one year. During the long Antarctic winter (approximately from late February until late October at most sites), the stations were completely isolated from the outside world except for radio communication.

Social background and personality data were collected as part of an intensive physical and psychiatric screening of all applicants for Antarctic service; the questionnaires containing group compatibility and accomplishment criterion data were administered by station medical officers near the end of the Antarctic winter. Items composing the Compatibility and Accomplishment Scales and items composing the most relevant personality and attitude scales are shown in Appendix A. Items included in the Compatibility Scale are concerned with how well members of the group got along together while items in the Accomplishment



Scale are concerned with how effectively the group carried out its tasks. Scores were obtained by summing response values on 6-point scales (Strongly Agree to Strongly Disagree). Mean scores on the Compatibility and Accomplishment scales were used as criteria of group effectiveness. Standard deviations were computed for each group on each of the personal history and personality variables selected for study, and these standard deviations for screening variables were correlated with mean Compatibility and Accomplishment scores. Pearson correlations were computed between screening variable standard deviations and Compatibility and Accomplishment mean scores over all groups for which these data were available (10 groups). It was possible to compute rank order (Rho) correlations for a larger sample of groups (15) by utilizing information pertaining to group compatibility and accomplishment from sources other than the questionnaire scales, that is, psychiatric debriefing reports, station leaders' logs, and station leaders' ratings of group compatibility and accomplishment. Close agreement was achieved by the authors in independently ranking, within the total sample of groups, the few station groups for which the criterion test scores were partially or completely absent. Generally, high consistency was present in the results obtained by the two methods of correlation. Tests of significance were derived from Dixon and Massey (1957), Table A-33a.

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Results

Relationships between heterogeneity and group compatibility and accomplishment criteria are shown in Table 1. The measure of heterogeneity for all variables was the standard deviation of scores or values

for members of each group who were tested at screening centers three to six months prior to deployment to Antarctica. For each criterion, the first column of results represents Pearson correlations between standard deviations for each variable and mean Compatibility or Accomplishment scores over the 10 groups. The second column represents rank order correlations based upon rankings on standard deviations for each variable and ranking on compatibility and accomplishment for 15 groups, including rankings for groups for which criterion test data were not available. Results for the two methods of correlation were generally similar for each criterion, and results overall for the two criteria were highly similar.

(Insert Table 1 about here.)

Compatibility and accomplishment as reported by group participants were highly related in these Antarctic groups. The Pearson correlation between Compatibility and Accomplishment mean scores was .97, and the correlation by the ranking method (Rho) was .99.

Overall, there was a marked trend for heterogeneity to correlate negatively with group compatibility and accomplishment. Significant results for specific variables suggest useful areas for further investigation in studies of group assembly. Contrary to expectations, variance in age was not correlated with compatibility or accomplishment. Nelson's (1964) earlier finding of a negative relationship was based

upon a sociometric criterion in small, closely associated work groups. Considering the group as a whole, wide differences in age do not relate significantly to compatibility as measured in this study. Similarly, variances in education level and in frequency of worship did not correlate significantly with either criterion. Variance in size of community of residence (urban-rural) was negatively correlated with both compatibility and accomplishment. The most striking result among the personal history variables was the high negative correlation between heterogeneity in the importance placed upon hobbies and recreational activities (number of hobbies liked) and the group effectiveness criteria. Groups in which there was wide diversity in the values placed upon avocational interests did not get along well together and were not productive.

Heterogeneity on personality scales generally tended to correlate negatively with the group performance criteria. Negative correlations attained significance ($p < .05$) for the Autonomy and Efficiency Scales and approached significance ($p < .10$) for the Motivation and Wanted Control Scales. These results tended to confirm predictions that attitudes and values most relevant to group maintenance or achievement would most likely affect compatibility and accomplishment. The contents of the Autonomy Scale shown in Appendix A are concerned with acceptance-rejection of group influence. Strong needs for autonomy or independence would seem to be inconsistent with group participation and support of group goals. Similarly, wide differences on the Wanted Control variable



could be interpreted as reflecting basic disagreement as to the need for and desirability of authority and group discipline. Rank correlations between heterogeneity on the Expressed Inclusion and Expressed Control scales attained or approached significant positive correlations with the Accomplishment criterion. A possible interpretation of this result would be that Expressed Control and Expressed Inclusion taken together reflect needs for dominance and that diversity on this variable may have positive, rather than negative implications for group cooperation.

Results for the Efficiency ($p < .05$) and Motivation ($p < .10$) Scales would appear consistent with the hypothesis that values pertaining to work and achievement of group goals would be more critical for group effectiveness than other needs and values.

Summing standard deviations for the Autonomy, Efficiency, and Motivation variables provided an overall index of group homogeneity-heterogeneity, and this index correlated .51 with Compatibility and .71 with Accomplishment. Thus, combining variances on a number of personality scales tends to enhance prediction of the group effectiveness criteria.

Discussion


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There seems little reason to doubt that group accomplishment is highly dependent upon interpersonal compatibility at Antarctic stations. The high degree of work and social interdependence among most group members and the inevitable stresses induced by prolonged confinement suggest that maintenance of group productivity at Antarctic stations

Gunderson & Nyman

would depend heavily upon continued interpersonal compatibility after several months of unremitting togetherness. A high correlation between Compatibility and Accomplishment mean scores, therefore, appears reasonable and predictable.

The relationship between heterogeneity in urban-rural residence and the Compatibility and Accomplishment criteria tends to agree with Newcomb's (1961) observation that among college dormitory residence similarities in urban-rural backgrounds played a significant role in clique formation. Differences in cultural style and expression are still to be expected between urban and rural populations, although the wide differences caricatured in the mass media a generation ago probably are much less striking today. However, the fact that some regional and urban-rural value differences exist is well established and that these differences may affect social affinities in intimate groups also seems plausible.

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The unexpected finding that importance placed upon hobbies and recreational interests is highly related to group compatibility and accomplishment is not difficult to rationalize. This result would appear to be highly consistent with the interpersonal exchange formulations developed by Thibaut and Kelley (1959) and Homans (1961) which holds that compatibility in social relationships is based upon possibilities for reciprocal rewards and costs (punishments). Members of closed groups who are dependent upon a variety of social activities requiring the participation of others will not value highly the companionship of other persons who are disinterested in such activities.

Results for the personality scales strongly suggest that reducing group heterogeneity on certain need and attitude dimensions may contribute to effective functioning of isolated work groups. The properties of groups as entities have been infrequently studied, and no data are available on long-term closed groups. Haythorn's review (1957) was addressed to the group assembly problem and described earlier studies. Altman and Haythorn (1966) have discussed effects of personality homogeneity-heterogeneity on compatibility and performance in dyads confined for 10 days. Friedlander (1964) stressed differences between ad hoc laboratory groups and natural organizational work groups and reported relationships of heterogeneity on age, job tenure, occupational level, and education to measures of group effectiveness and "intragroup trust" in a large research organization. Only heterogeneity on educational level was significantly (negatively) correlated with group effectiveness and trust in that setting. Educational level obviously is highly relevant to achievement in a research setting, and the above result appears consistent with the hypothesis that heterogeneity on variables most relevant to the group enterprise would be expected to affect compatibility and accomplishment.

Friedlander noted that group size was substantially correlated (negatively) with group effectiveness and trust in his study; in the present study group size was not related to compatibility and accomplishment or to heterogeneity on any of the variables studied.

Schutz (1958) has proposed techniques for composing groups using his measures of expressed and wanted inclusion, control, and affection. In the present study, consideration of these scales (the FIRO-B Inventory) was limited to the effects of heterogeneity of single scales. Further analysis is needed to test Schutz's specific predictions.

The problem of group composition is an important one in a number of settings, but especially so in situations involving prolonged isolation and unusual stress. Although the complexities of the problem and the multiplicity of concepts and methods have often seemed confusing or discouraging, the results of the present exploratory study appear promising as one approach to increasing group effectiveness.

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Footnotes

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²Statistical assistance was provided by Mr. George Seymour.

Table 1

Correlations Between Heterogeneity on Personality and
Personal History Variables and Group Compatibility and Accomplishment

Screening Variables (Standard Deviations)	<u>Compatibility</u>		<u>Accomplishment</u>	
	Mean (Pearson)	Rank (Rho)	Mean (Pearson)	Rank (Rho)
Personal History:				
Age	.199	.171	.051	.014
Education	-.016	-.171	.231	-.132
Worship	.041	.085	-.128	-.026
Urban-rural	-.673**	-.471**	-.612**	-.354*
Number of hobbies	-.851**	-.761**	-.847**	-.611**
Number of groups	10	15	10	15
Personality Scales (Self):				
Achievement	.115	-.400*	.131	-.239
Autonomy	-.424	-.489**	-.551**	-.575**
Nurturance	-.087	-.364*	-.217	-.312
Orderly	-.238	-.275	-.309	-.279
Useful	-.139	-.046	-.112	.076
Motivation	-.443*	-.349	-.442*	-.313
Decisive	-.400	-.257	-.256	-.124
Number of groups	10	15	10	15
Expressed Inclusion	-.131	.346	-.040	.459**
Wanted Inclusion	.082	-.154	.342	-.046
Expressed Control	.248	.311	.324	.418*
Wanted Control	-.485*	-.182	-.492*	-.182
Expressed Affection	-.248	-.232	-.104	-.071
Wanted Affection	-.036	-.004	.180	.179
Number of groups	10	15	10	15
Friend Description:				
Efficient	-.329	-.524**	-.536**	-.551**
Sympathy	-.347	-.196	-.304	-.321
Caution	.183	-.093	.124	-.094
Optimism	-.036	-.229	-.237	-.121
Number of groups	10	15	10	15

* $p < .10$ ** $p < .05$

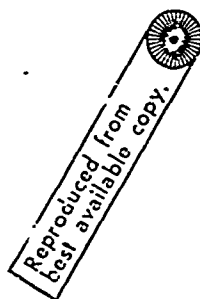
Appendix A.

Scales for Group Criterion Measures
and Relevant Personality Need Measures

Criterion Scales:

Compatibility: The men at this station work well together as a team.
Group spirit at this station is high.
Members of this station disagree a lot with one another.
The men at this station are the kind of men I like to spend a lot of time with.
Everybody pulls together to get things done around here.
There is a pretty good feeling among the men at this station.

Accomplishment: This group does not seem to accomplish much.
We usually have a good idea of what everyone else is doing.
Everyone here would feel badly if the group did not accomplish its mission.
When the going gets rough, this group is at its best.
Everyone takes a lot of pride in what this group accomplishes.



Screening Scales:

Autonomy: I like to be able to come and go as I please.
I like to do things my own way, even though they turn out badly.
I like to criticize people who are in a position of authority.
I like to feel free to do what I want to do.
It bothers me when someone tries to tell me what to do.
I like to disregard rules that I consider to be unjust.

Autonomy:
(continued)

Once I have made up my mind, no one can change it for me.

I prefer to do things my own way, without regard to what others may think.

Motivation:

Being part of an Antarctic expedition will be the highlight of my career.

A large proportion of the people I know would like to go to the Antarctic.

Most of the men who go to the Antarctic will probably wish they had stayed in the United States.

I like the idea of waiting several months before we go to the Antarctic.

I would like to stay in the Antarctic longer than now planned.

Efficiency:

Industrious

Punctual

Ambitious

Tidy

Efficient

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